Arthroscopic release for painful subtalar stiffness after intra-articular fractures of the calcaneum


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We describe the surgical technique and results of arthroscopic subtalar release in 17 patients (17 feet) with painful subtalar stiffness following an intra-articular calcaneal fracture of Sanders’ type II or III. The mean duration from injury to arthroscopic release was 11.3 months (6.4 to 36) and the mean follow-up after release was 16.8 months (12 to 25). The patient was positioned laterally and three arthroscopic portals were placed anterolaterally, centrally and posterolaterally. The sinus tarsi and lateral gutter were debrided of fibrous tissue and the posterior talocalcaneal facet was released. In all, six patients were very satisfied, eight were satisfied and three were dissatisfied with their results. The mean American Orthopaedic Foot and Ankle Society ankle-hindfoot score improved from a mean of 49.4 points (35 to 66) pre-operatively to a mean of 79.6 points (51 to 95). All patients reported improvement in movement of the subtalar joint. No complications occurred following operation, but two patients subsequently required subtalar arthrodesis for continuing pain.

In the majority of patients a functional improvement in hindfoot function was obtained following arthroscopic release of the subtalar joint for stiffness and pain secondary to Sanders type II and III fractures of the calcaneum.

Subtalar stiffness is a common complication of intra-articular fracture of the calcaneum.1-3 Typically, patients complain of increased pain or discomfort while bearing weight on uneven ground.4 Its treatment is difficult. The surgical options include open or arthroscopic subtalar release, but the extensive incision required for the former procedure prohibits early post-operative mobilisation. Lui2 described a technique of arthroscopic subtalar release for post-traumatic stiffness which allows early post-operative mobilisation after operation. However, the results have not been reported. We therefore describe the technique of arthroscopic subtalar release in patients with painful subtalar stiffness after treatment for an intra-articular fracture of the calcaneum, and assess the results.

Patients and Methods

We retrospectively reviewed the results of 17 consecutive arthroscopic subtalar releases undertaken between September 2005 and October 2006. All the patients were male, and their mean age was 42.4 years (24 to 56). The mechanism of injury involved a fall in 13 patients and a motor vehicle accident in four. Using Sanders’ classification5 of intra-articular calcaneal fractures 11 patients had a type II fracture and six a type III. The primary treatment had been open reduction and internal fixation with a plate and screws using an extensile lateral approach in type III injuries, and closed reduction and pinning or casting in type II. The mean duration from injury to arthroscopic release was 11.3 months (6.4 to 36), and the mean follow-up after release was for 16.8 months (12 to 25) (Table I).

Inclusion criteria were isolated subtalar stiffness with pain on weight-bearing which was aggravated by walking on uneven ground; articular incongruity less than 2 mm at the posterior facet of the subtalar joint; no narrowing of the joint space or osteophyte formation on plain radiographs and CT scans; and failure to respond to conservative treatment, including pain control with analgesic non-steroidal anti-inflammatory medication and functional rehabilitation with physiotherapy.

Operative technique. The procedure was performed with patients in the lateral position with the affected foot uppermost under general
anaesthesia. After standard preparation and draping, the positions of the lateral malleolus, the intermediate dorsal cutaneous branch of the superficial peroneal nerve, the peroneal tendons and the tendo Achillis were drawn on the skin.

The anterolateral, middle and posterolateral portals for arthroscopy of the subtalar were marked at the estimated sites. During the second stage, the lateral gutter (lateral talocalcaneal facet joint) could be examined. During the first stage of the operation, fibrous tissue in the sinus tarsi was debrided using shaver to visualise the anterior and lateral joint line of the posterior subtalar facet. The anterolateral portal, and lateral subtalar fibrous tissue and impinging soft tissue from the calcaneal fracture were debrided. This was followed by stripping the lateral subtalar capsule and adhesions from the lateral calcaneal cortex with a shaver and small periosteal elevator (Fig. 2). In the majority of cases subtalar movement was substantially recovered at this stage, and the articular surface of the posterior subtalar facet could be examined.

Finally, the posterior portion of the posterior talocalcaneal facet joint was visualised and fibrous tissue was debrided via the posterolateral portal. When this was difficult because of arthrofibrosis, atraumatic distraction was performed using a foot strap. The posterior capsule was then released, and the subtalar joint was passively inverted and everted to improve movement. The extent of subtalar movement was examined under arthroscopic visualisation. The skin incisions were closed with nylon sutures, and a bulky sterile dressing was applied. Active and passive subtalar mobilisation and peroneal strengthening exercises were started on the second post-operative day. The patient was permitted to bear weight as tolerated.

**Arthroscopic and clinical evaluation.** Post-operative clinical evaluations (by KBL) included assessment of patient satisfaction using a scale of very satisfied, satisfied and dissatisfied, the AOFAS ankle–hindfoot scores, recovery of subtalar movement and post-operative complications.
The extent of subtalar movement was determined while the patient was prone on the examining table with their knee flexed to approximately 135°, in which position the axis of the subtalar joint lies close to the horizontal plane. The calcaneum was placed in line with the long axis of the tibia and held in one hand. The heel was then inverted and everted passively while the extent of movement was measured with a goniometer. The movement of the subtalar joint was described as a percentage of that of the normal side. These values were used to define three groups: a normal joint or mild restriction (75% to 100%), moderate restriction (25% to 74%), and marked restriction (< 25%).

The condition of the cartilage of the subtalar joint was rated using the International Cartilage Repair Society (ICRS) classification system, which focuses on the depth of any lesion and the area of damage.

**Statistical analysis.** The Mann-Whitney U test was used to evaluate the relationship of the interval between the initial injury (< one year or > one year) and the arthroscopic release, and the subtalar movement at the last follow-up with clinical outcome. The effect of the grade of injury according to the Sanders’ classification and the method of treatment following injury on the clinical outcome were analysed using the Kruskal-Wallis test. All statistical analyses were performed using SPSS (version 12.0; SPSS Inc., Chicago, Illinois) and were reviewed by an independent statistician.

**Results**

The results are shown in Table I. In all, six of 17 patients were ‘very satisfied’, eight were ‘satisfied’, and three were ‘dissatisfied’. The 14 patients (82%) who were either very satisfied or satisfied had relief of pain, were able to perform activities of daily living and did not require further local injections or surgical management (Fig. 3). However, pain persisted in the three dissatisfied patients. Two of these
(patients 4 and 8) required subsequent subtalar fusion at seven months and 12 months after arthroscopy, which had revealed severe cartilage damage (grade 4).

The mean pre-operative AOFAS\textsuperscript{6} ankle-hindfoot score for all patients was 49.4 points (35 to 66), and this improved to a mean of 79.6 (51 to 95) at final follow-up. At final follow-up the mean AOFAS\textsuperscript{6} score in patients who underwent arthroscopic release within one year of injury was significantly higher than that of those who had the procedure more than one year after injury. The mean AOFAS\textsuperscript{6} score in the eight patients who underwent release within one year of injury improved from a mean of 52 points (35 to 66) to a mean of 86 (81 to 95), and that of the nine patients who underwent release after more than one year after injury improved significantly from a mean of 48 (38 to 59) to a mean of 75 (51 to 87) at final follow-up (Mann-Whitney U test; \( p = 0.04 \)).

The grades of damage to the subtalar articular cartilage were 1 in six patients, 2 in eight, 3 in one and 4 in two patients. There was a statistically significant relationship between the grades of articular cartilage and the post-operative AOFAS score (Kruskal-Wallis test; \( p = 0.049 \)). However, the types of fracture as defined by Sanders' classification\textsuperscript{5} and the initial method of treatment at injury had no significant relationship with clinical outcome (Kruskal-Wallis test; \( p = 0.658 \)).

All patients had improvement in movement of the subtalar joint after release. Subtalar joint movement at the last
follow-up was normal or mildly restricted in ten patients, and moderately restricted in seven. However, no statistical significance was found between patient satisfaction and the degree of recovery of subtalar stiffness (Mann-Whitney test; p = 0.317).

Post-operatively no patient had a wound infection, neurona formation or subtalar instability.

Discussion

Fracture of the calcaneum accounts for 60% of injuries to tarsal bones and 2% of all fractures.\textsuperscript{2,4} Intra-articular fractures of the calcaneum have consistently been shown to cause significant disability.\textsuperscript{5} In particular, painful subtalar stiffness may frequently occur.\textsuperscript{1-3} Pozo et al\textsuperscript{3} found that 17 of 21 patients with intra-articular fractures treated non-operatively had movement of the subtalar joint < 50% of their normal side. Järvholm et al\textsuperscript{1} noted that the operative group retained 50% of normal subtalar joint movement compared to 20% in the non-operative group. The causes of restricted movement have been attributed to intra-articular arthrofibrosis of the subtalar joint, extra-articular scarring, and adhesion of lateral soft tissues to the lateral calcaneal cortex.\textsuperscript{2,13}

In order to restore subtalar movement, vigorous exercises and modifications to footwear during the period of rehabilitation are required. However, when this strategy fails, operative treatment can be considered.

Open subtalar release has the advantage of allowing removal of hardware, but early post-operative mobilisation is prevented by the extensive surgical wound. In contrast, arthroscopic subtalar release is minimally invasive, which facilitates early mobilisation and allows the condition of the posterior calcaneal facet to be examined.\textsuperscript{2,13-15}

Parisien and Vangsness\textsuperscript{8} demonstrated that in cases of arthrofibrosis of the subtalar joint dramatic relief of pain and an improved range of movement can be obtained after arthroscopic excision of adhesions. Elgafy and Ebraheim\textsuperscript{13} described ten consecutive patients who underwent subtalar arthroscopy for persistent pain in the subfibular area after open reduction and internal fixation of intra-articular fractures of the calcaneum. Considerable relief of pain was obtained by eight patients, and the two who required subtalar fusion had grade IV degenerative lesions. In 2006, Lui\textsuperscript{2} also described an arthroscopic technique of subtalar release for post-traumatic subtalar stiffness that allows early post-operative mobilisation.

In the present study, 14 patients were either very satisfied or satisfied. In the two patients who required fusion, arthroscopy had revealed grade 4 cartilage damage. Arthroscopic release is a useful procedure for treating painful subtalar stiffness but cannot be relied upon to improve symptoms in patients with severe articular cartilage damage.

All patients had an improvement in movement in the subtalar joint after release. However, satisfaction was not found to be related to the degree of recovery from stiffness. The AOFAS\textsuperscript{6} ankle-hindfoot score in patients who underwent arthroscopic release within one year of injury significantly improved more than that in patients who underwent release more than one year after injury (Mann-Whitney U test; p = 0.04). This suggests that although arthroscopic release plays an important role in the recovery of subtalar movement regardless of the duration between initial injury and release, recovery of movement contributes less to relief of pain in patients who undergo release after a delay exceeding one year from the initial injury.

The limitations of this study are that it lacks randomisation between an open subtalar release and an arthroscopic release, and that no investigation was conducted on the effects of combined lesions, such as fracture of the talus, on the clinical outcomes.

Arthroscopic subtalar release is an invaluable procedure for the treatment of painful subtalar stiffness when conservative treatment fails. The procedure allows early post-operative subtalar mobilisation, improved subtalar joint movement, reduces chronic subtalar pain and improves functional outcome without post-operative morbidity.

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References